cont'd B2 depositing a patterned or non-patterned fourth layer of a metal on the tope of the third layer, whereby the fourth layer constitutes the cathode of the electrode arrangement.

REMARKS

Status of the claims

Claims 2-4 have been cancelled as indicated above. As such, claims 1 and 5-17 remain pending in the application.

Amendments to the specification

The paragraph on page 8, beginning at line 8 has been amended to correct a readily apparent typographical error with regard to the reference to Figure 3b at page 8, line 22. The specification had incorrectly referenced "fig 2b." The occurrence of this typographical error and correction thereof would be readily apparent to one reading the specification because the paragraph in question discusses specifically the contents of Figure 3 and because of the subject matter of that discussion.

Rejections under 35 U.S.C. §102(b)

The Examiner has rejected claims 1-17 under 35 U.S.C. §102(b) as being anticipated by Cao (U.S. Pat. No. 5,965,281). Cao is asserted to teach a method of fabricating an organic thin-film semiconducting device that comprises

depositing a first layer of conducting 14...on an

> insulating substrate 12,...modifying the work function of the conducting first layer 14 by depositing a second layer 16 of conducting polymer with a work function higher than that of the material of the first layer 14,...whereby the combination of the first and second layer constitutes the anode of the electrode arrangement and the work function of the anode becomes substantially equal to that of the conducting polymer, depositing a third layer 24 of semiconducting organic material...and depositing a patterned or non-patterned fourth layer 18 of metal...whereby the fourth layer constitutes the cathode.

Applicants traverse this rejection and withdrawal thereof is respectfully requested. The present invention, as encompassed in part by claim 1, is drawn to a method of fabricating an organic thin-film semiconducting device by

depositing a first layer of a conducting material of calcium, manganese, aluminum, nickle, copper or silver or semiconducting material of silicon, germanium, or gallium arsenide or a combination of a conducting and a semiconducting material in the form of a patterned or non-patterned layer on an insulating substrate,

modifying the work function of the conducting and/or semiconducting material of the first layer by depositing a second layer of a conducting polymer with a work function higher than that of the material in the first layer such that the layer of the conducting polymer mainly covers the first layer or is conformal with the latter, whereby the combination of the first and second layer is the anode and has a work function substantially equal to that of the conducting polymer,

depositing a third layer of semiconducting organic material on top of the anode, and if only a portion of the substrate is covered by the anode, at least some of the portion of the substrate not covered by the anode, and depositing a patterned or non-patterned fourth layer of a metal on the tope of the third layer, whereby the fourth layer constitutes the cathode of the electrode arrangement.

> To anticipate, a single reference must teach every limitation of the claimed invention. Mehl/Biophile International Corp. v. Milgraum 52 USPQ2d 1303 (Fed. Cir. 1999).

Cao fails to disclose a device having every limitation of the claimed invention. The present invention specifically recites an anode comprising more than one component. The anode of the present invention is made from a first layer of a conducting material selected from material of calcium, manganese, aluminum, nickle, copper or silver or a semiconducting material selected from silicon, germanium, or gallium arsenide or a combination of a conducting and a semiconducting material and a second layer made of a conducting polymer with a work function higher than that of the material in the first layer such the work function of the material of the first layer is modified and the anode and has a work function substantially equal to that of the conducting polymer.

The only disclosure in Cao of an anode having a multilayer structure is in Example 8, wherein bilayer anodes made from ITO over-coated with a polythiophene polymer are disclosed. The first layer of the anode of the present invention is not made

from ITO. As such, there is no disclosure in Cao of the anodes of the presently claimed invention and the present invention is not anticipated by the reference.

The present invention is further not obvious over Cao. The teachings of Cao are directed a photovoltaic diode that includes a surfactant additive to enhance performance. See column 15, lines 27-32. The present invention, on the other hand, is directed to a method of making an organic thin-film semiconductor having a high rectification ratio, efficient charge injection, and with patterned line widths on the order of 1μm. See pages 2 and 3 of the specification. As noted on page 9 of the specification, by manufacturing organic thin-film semiconductors using the method of the present invention, it is possible to obtain devices having a rectification ratio of 10^6-10^7 at 3 volts and above. The present inventors have found that by using a bilayer anode having a charge-injecting conducting polymer combined with a metal having a lower work function than the polymer, an unexpectedly high rectification ratio is achieved. There is no suggestion of achieving organic thin-film semiconductors having these properties in Cao. As such, the present invention is not suggested by Cao.

In fact, Cao teaches away from the present invention because Cao teaches in column 10, lines 19-31 that gold and platinum are suitable and equivalent metals for an anode component. This is further evidenced by the use of gold as an anode material in Example 8 of Cao. However, as detailed page 6, final paragraph

of the specification, gold and platinum are unsuitable materials for the first layer of the anode component of the present invention. Cao further teach away from the present invention with the use of ITO in the anode layer because ITO is not suitable for the anodes of the organic thin-film semiconducting device of the present invention. ITO is not suitable for use as a component in the anode element of the present invention because ITO would be detrimental to the polymer layer and because ITO has a high contact resistance. As such, the present invention is not obvious over Cao and withdrawal of the rejection is respectfully requested.

Claim 10 has been further rejected as being obvious over Cao combined with Staring et al., U.S. Pat. No. 6,014,119. Staring et al. fails to make up for the deficiencies of Cao discussed above. As such, the present invention of claim 10 is not achieved by combining Cao with Staring et al. and withdrawal of the rejection is respectfully requested.

Should the Examiner have any questions regarding the present application, he is requested to please contact MaryAnne Armstrong, PhD (Reg. No. 40,069) in northern Virginia at (703) 205-8000.

Attached hereto is a marked-up version showing all amendments.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By MA Armstrong
MaryAnne Armstrong, PhD., #40,069

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

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MARKED-UP VERSION SHOWING CHANGES

IN THE SPECIFICATION

The paragraph beginning at page 8, line 8 of the specification has been amended as follows.

--Fig. 3b shows the current/voltage characteristic expressed respectively through the forward current in the conducting direction and backward current in the blocking direction of a diode according to prior art (solid lines) and of a diode made according to the method of the present invention (lines with circles/dots). The known diode is made with P3HT as the semiconducting material, spin-coated at 600 rpm from a 5 mg/ml solution and arranged between a copper anode and an aluminium cathode, respectively. The current in the forward direction is shown by the upper solid line and the current in the backward direction by the lower solid line. The diode made by the method according to the present invention has an anode 2, 3 made from a double layer of copper and PEDOT-PSS as the conducting polymer, spin-coated at 3000 rpm. The active semiconducting material P3HT is spin-coated at 600 rpm from a 5 mg/ml solution, and the cathode is made from aluminium. In this case the characteristic has been determined through two measurement series, and as can be seen from fig. ~~2b~~ **3b** the results are virtually identical. The respective measurement series are discerned through curves with open or closed circles, respectively. The two upper, almost coinciding curves exhibit the current in the forward

direction, while the lower curves exhibit the current in the backward direction. The difference compared to the diode made by conventional means is obvious.--

IN THE CLAIMS

Claims 2-4 have been cancelled.

Claim 1 has been amended as follows.

1. (Amended) A method in the fabrication of an organic thin-film semiconducting device, wherein the semiconducting device comprises an electrode arrangement with electrodes contacting a semiconducting organic material, and wherein the method is characterized by

depositing a first layer of a conducting **material selected from the group consisting of calcium, manganese, aluminum, nick~~le~~,** nickel. **copper and silver** or **a** semiconducting material **selected from the group consisting of silicon, germanium, and gallium arsenide** or a combination of a conducting and a semiconducting material in the form of a patterned or non-patterned layer on an insulating substrate, such that at least a portion of the substrate is covered by the first layer

modifying the work function of the conducting and/or semiconducting material of the first layer by depositing a second layer of a conducting polymer with a work function higher than that of the material in the first layer such that the layer of the conducting polymer mainly covers the first

layer or is conformal with the latter, whereby the combination of the first layer and second layer constitutes the anode of the electrode arrangement and the work function of the anode becomes substantially equal to that of the conducting polymer,

depositing a third layer of semiconducting organic material on top of the anode, and optionally and in case only a portion of the substrate is covered by the anode, also above at least some of the portion of the substrate not covered by the anode, and

depositing a patterned or non-patterned fourth layer of a metal on the tope of the third layer, whereby the fourth layer constitutes the cathode of the electrode arrangement.